

Fashion, too, influences demand. Frames come in a variety of styles and colors—encouraging people to buy more than one pair. Demand is also expected to grow in response to the availability of new technologies that improve the quality and look of corrective lenses, such as anti-reflective coatings and bifocal lenses without the line visible in traditional bifocals.

Most job openings will arise from the need to replace technicians who transfer to other occupations or leave the labor force. Only a small number of total job openings will occur each year because the occupation is small.

Earnings

Median hourly earnings of ophthalmic laboratory technicians were \$9.39 in 1998. The middle 50 percent earned between \$7.56 and \$11.58 an hour. The lowest 10 percent earned less than \$6.48 and the highest 10 percent earned more than \$15.74 an hour. Median hourly earnings of ophthalmic laboratory technicians in 1997 were \$8.60 in ophthalmic goods and \$8.30 in retail stores, not elsewhere classified.

Related Occupations

Workers in other precision production occupations include biomedical equipment technicians, dental laboratory technicians, orthodontic technicians, orthotics technicians, prosthetics technicians, and instrument repairers.

Sources of Additional Information

For general information about a career as an ophthalmic laboratory technician and a list of accredited programs in ophthalmic laboratory technology, contact:

☛ Commission on Opticianry Accreditation, 10111 Martin Luther King, Jr. Hwy., Suite 100, Bowie, MD 20720-4299.
Internet: <http://www.coaccreditation.com>

Painting and Coating Machine Operators

(O*NET 92947, 92951, and 92953)

Significant Points

- Most workers acquire their skills on the job; for most operators, training lasts from a few days to several months, but becoming skilled in all aspects of automotive painting usually requires 1 to 2 years.
- Slower-than-average growth is projected through 2008, but job prospects should be favorable.

Nature of the Work

Millions of items ranging from cars to candy are covered by paint, plastic, varnish, chocolate, or some other type of coating solution. Often the protection provided by the paint or coating is essential to the product, as with the coating of insulating material covering wires and other electrical and electronic components. Many paints and coatings have dual purposes, such as the paint finish on an automobile, which heightens the visual appearance of the vehicle while providing protection from corrosion.

Painting and coating machine operators control the machinery that applies these paints and coatings to a wide range of manufactured products. Perhaps the most straightforward technique is simply dipping an item in a large vat of paint or other coating. This is the technique used by *dippers*, who immerse racks or baskets of articles in vats of paint, liquid plastic, or other solutions using a power hoist. Similarly, *tumbling barrel painters* deposit articles made of porous materials in a barrel of paint, varnish, or other coating, which is then rotated to insure thorough coverage.

Another familiar technique is spraying products with a solution of paint or other coating. *Spray-machine operators* use spray guns to coat metal, wood, ceramic, fabric, paper, and food products with paint and other coating solutions. Following a formula, operators fill the equipment's tanks with a mixture of paints or chemicals, adding prescribed amounts of solution. They adjust nozzles on the spray guns to obtain the proper dispersion of the spray and hold or position the guns to direct the spray onto the article. Operators also check the flow and viscosity of the paint or solution and visually inspect the quality of the coating. When products are drying, these workers must often regulate the temperature and air circulation in drying ovens.

Painting and coating machine operators use various types of spray machines to coat a range of products. Often, their job title reflects the specialized nature of the machine or the coating being applied. For example, *enrobing machine operators* coat, or "enrobe," confectionery, bakery, and other food products with melted chocolate, cheese, oils, sugar, or other substances. *Paper coating machine operators* spray "size" on rolls of paper to give it its gloss or finish. And *silvering applicators* spray silver, tin, and copper solutions on glass in the manufacture of mirrors.

In response to concerns about air pollution and worker safety, manufacturers increasingly use new types of paints and coatings on their products instead of high-solvent paints. Water-based paints and powder coatings are two of the most common. These compounds do not emit as many volatile organic compounds into the air and can be applied to a variety of products. Powder coatings are sprayed much like liquid paints and then heated to melt and cure the coating.

The adoption of new types of paints is often accompanied by a conversion to more automated painting equipment that the operator sets and monitors. When using these machines, operators position the automatic spray guns, set the nozzles, and synchronize the action of the guns with the speed of the conveyor carrying articles through the machine and drying ovens. The operator may also add solvents or water to the paint vessel that prepares the paint for application. During operation, these workers tend painting machines, observe gauges on the control panel, and randomly check articles for evidence of any variation from specifications. The operator then uses a spray gun to "touch up" spots where necessary.

Although the majority of painting and coating machine operators are employed in manufacturing, the best known group of these workers refinish old and damaged cars, trucks, and buses in automotive body repair and paint shops. *Automotive painters* are among the most highly skilled manual spray operators because they perform intricate, detailed work and mix paints to match the original color, a task that is especially difficult if the color has faded.

To prepare a vehicle for painting, automotive painters or their helpers use power sanders and sandpaper to remove the original paint or



A painting and coating machine operator carefully prepares a car before painting.

rust, and then fill small dents and scratches with body filler. They also remove or mask parts they do not want to paint, such as chrome trim, headlights, windows, and mirrors. Automotive painters use a spray gun to apply several coats of paint. They apply lacquer, enamel, or water-based primers to vehicles with metal bodies, and flexible primers to newer vehicles with plastic body parts. Controlling the spray gun by hand, they apply successive coats until the finish of the repaired sections of the vehicle matches that of the original undamaged portions. To speed drying between coats, they may place the freshly painted vehicle under heat lamps or in a special infrared oven. After each coat of primer dries, they sand the surface to remove any irregularities and to improve the adhesion of the next coat. Final sanding of the primers may be done by hand with a fine grade of sandpaper. A sealer is then applied and allowed to dry, followed by the final topcoat. When lacquer is used, painters or their helpers usually polish the finished surface after the final coat has dried.

Working Conditions

Painting and coating machine operators work indoors and may be exposed to dangerous fumes from paint and coating solutions. Although painting is usually done in special ventilated booths, many operators wear masks or respirators that cover their noses and mouths. In addition, the Clean Air Act of 1990 has led to a decrease in workers' exposure to hazardous chemicals by regulating emissions of volatile organic compounds from paints and other chemicals. This legislation has also led to increasing use of more sophisticated paint booths and fresh air systems which provide a safer work environment.

Operators have to stand for long periods of time and, when using a spray gun, they may have to bend, stoop, or crouch in uncomfortable positions to reach different parts of the article. Most operators work a normal 40-hour week, but self-employed automotive painters sometimes work more than 50 hours a week, depending on the number of vehicles customers want repainted.

Employment

Painting and coating machine operators held about 171,000 jobs in 1998. Lesser skilled operators accounted for about 3 out of 4 jobs, while more skilled transportation equipment painters accounted for about 1 out of 4. More than 85 percent of jobs for salaried workers were found in manufacturing establishments, where they applied coatings to items such as fabricated metal products, motor vehicles and related equipment, industrial machines, household and office furniture, and plastics, wood, and paper products. Other workers included automotive painters employed by independent automotive repair shops and body repair and paint shops operated by retail motor vehicle dealers. About 6 percent of painting and coating machine operators were self-employed; most of these were automotive painters.

Training, Other Qualifications, and Advancement

Most painting and coating machine operators acquire their skills on the job, usually by watching and helping experienced operators. For most operators, training lasts from a few days to several months. Coating and painting machine operators who modify the operation of computer-controlled equipment during operation may require additional training in computer operations and minor programming.

Similar to painting and coating machine operators, most automotive painters start as helpers and gain their skills informally on the job. Becoming skilled in all aspects of automotive painting usually requires 1 to 2 years of on-the-job training. Beginning helpers usually remove trim, clean and sand surfaces to be painted, mask surfaces that they do not want painted, and polish finished work. As helpers gain experience, they progress to more complicated tasks, such as mixing paint to achieve a good match and using spray guns to apply primer coats or final coats to small areas.

Painters should have keen eyesight and a good sense of color. Completion of high school is generally not required but is advantageous. Additional instruction is offered at many community colleges

and vocational or technical schools. Such programs enhance one's employment prospects and can speed promotion to the next level.

Some employers sponsor training programs to help their workers become more productive. This training is available from manufacturers of chemicals, paints, or equipment or from other private sources. It may include safety and quality tips and knowledge of products, equipment, and general business practices. Some automotive painters are sent to technical schools to learn the intricacies of mixing and applying different types of paint.

Voluntary certification by the National Institute for Automotive Service Excellence (ASE) is recognized as the standard of achievement for automotive painters. For certification, painters must pass a written examination and have at least 2 years of experience in the field. High school, trade or vocational school, or community or junior college training in automotive painting and refinishing may substitute for up to 1 year of experience. To retain certification, painters must retake the examination at least every 5 years.

Experienced painting and coating machine operators with leadership ability may become team leaders or supervisors. Those who acquire practical experience or college or other formal training may become sales or technical representatives for chemical or paint companies. Eventually, some automotive painters open their own shops.

Job Outlook

Job prospects should be favorable for skilled automotive painters and new entrants with vocational school training in this specialty, as numerous employers have reported difficulties in locating qualified applicants. Overall employment of painting and coating machine operators is expected to grow more slowly than the average for all occupations through the year 2008. Employment growth for highly skilled transportation painters and automotive refinishers is projected to be slightly faster than for lesser skilled painting and coating machine operators. In addition to job growth, several thousand jobs will become available each year as employers replace experienced operators who transfer to other occupations or leave the labor force.

An increasing population demanding more manufactured goods will spur employment growth among painting and coating machine operators. Employment growth will be limited, however, by improvements in the automation of paint and coating applications that will raise worker productivity. For example, operators will be able to coat goods more rapidly as they use increasingly sophisticated industrial robots that move and aim spray guns more like humans; as the cost of robots continues to fall, they will be more widely used. The Clean Air Act of 1990, which sets limits on the emissions of ozone-forming volatile organic compounds, also is expected to impede the employment growth of operators in manufacturing because firms tend to introduce more efficient automation as they switch to water-based and powder coatings to comply with the law.

Because the detailed work of refinishing automobiles in collision repair shops and motor vehicle dealerships does not lend itself to automation, painters employed in these establishments are projected to experience more rapid growth. As the demand for refinishing continues to grow, slower productivity growth among these workers will lead to employment increases more in line with the growing demand for their services.

The number of job openings for painting and coating machine operators may fluctuate from year to year due to cyclical changes in economic conditions. When demand for manufactured goods lessens, production may be suspended or reduced, and workers may be laid off or face a shortened workweek. Automotive painters, on the other hand, can expect relatively steady work because automobiles damaged in accidents require repair and refinishing regardless of the state of the economy.

Earnings

Median hourly earnings of coating, painting, and spraying machine operators, tenders, setters, and set-up operators were \$10.49 in 1998. The middle 50 percent earned between \$8.49 and \$12.90 an hour. The

lowest 10 percent earned less than \$6.93 and the highest 10 percent earned more than \$15.62 an hour.

Median hourly earnings of transportation equipment painters were \$14.00 in 1998. The middle 50 percent earned between \$10.86 and \$18.95 an hour. The lowest 10 percent earned less than \$8.50 and the highest 10 percent earned more than \$23.37 an hour. Median hourly earnings of transportation equipment painters in 1997 were \$13.30 in automotive repair shops and \$15.50 in motor vehicle and equipment manufacturing.

Many automotive painters employed by motor vehicle dealers and independent automotive repair shops receive a commission based on the labor cost charged to the customer. Under this method, earnings depend largely on the amount of work a painter does and how fast it is completed. Employers frequently guarantee commissioned painters a minimum weekly salary. Helpers and trainees usually receive an hourly rate until they become sufficiently skilled to work on commission. Trucking companies, bus lines, and other organizations that repair and refinish their own vehicles usually pay by the hour.

Many painting and coating machine operators belong to unions. Most union operators work for manufacturers and the larger motor vehicle dealers.

Related Occupations

Other occupations in which workers apply paints and coatings include construction and maintenance painters, electrolytic metal platers, and hand painting, coating, and decorating occupations.

Sources of Additional Information

For more details about work opportunities, contact local manufacturers, automotive-body repair shops, motor vehicle dealers, and vocational schools; locals of unions representing these workers; or the local office of the State employment service. The State employment service also may be a source of information about training programs.

Information on how to become a certified automotive painter is available from:

✦ National Institute for Automotive Service Excellence (ASE), 13505 Dulles Technology Dr., Suite 2, Herndon, VA 20171-3421. Internet: <http://www.asecert.org>

Photographic Process Workers

(O*NET 89914A, 89914B, 89914C, 89914D, and 92908)

Significant Points

- Employment opportunities for photographic process workers are expected to decline as digital photography becomes commonplace.
- Most photographic process workers receive on-the-job training from their companies, manufacturers' representatives, and experienced workers.

Nature of the Work

Both amateur and professional photographers rely heavily on photographic process workers to develop film, make prints or slides, and do related tasks, such as enlarging or retouching photographs. *Photographic processing machine operators and tenders* operate various machines, such as mounting presses and motion picture film printing, photographic printing, and film developing machines. *Precision photographic process workers* perform more delicate tasks, such as retouching photographic negatives and prints to emphasize or correct specific features.

Photographic processing machine operators and tenders often have specialized jobs. *Film process technicians* operate machines that develop exposed photographic film or sensitized paper in a series of

chemical and water baths to produce negative or positive images. First, technicians mix developing and fixing solutions, following a formula. They then load the film in the machine, which immerses the exposed film in a developer solution. This brings out the latent image. The next steps include immersing the negative in a stop-bath to halt the developer action, transferring it to a hyposolution to fix the image, and then immersing it in water to remove the chemicals. The photographic process worker then dries the film. In some cases, these steps are performed by hand.

Color printer operators control equipment that produces color prints from negatives. These workers read customer instructions to determine processing requirements. They load film into color printing equipment, examine negatives to determine equipment control settings, set controls, and produce a specified number of prints. Finally, they inspect the finished prints for defects, remove any that are found, and insert the processed negatives and prints into an envelope for return to the customer.

Paper process technicians develop strips of exposed photographic paper; *takedown sorters* sort processed film; and *automatic mounters* operate equipment that cuts and mounts slide film into individual transparencies.

Precision photographic process workers, sometimes known as *digital imaging technicians*, use computer images of conventional negatives and specialized computer software to vary the contrast of images, remove unwanted background, or combine features from different photographs. The use of computers and digital technology is replacing much manual work, but some precision photographic process



Photographic process workers develop film, make prints or slides, and enlarge or retouch photographs.